also reduce the reproduction potential of adult sparrows flushed from nests through a significant disruption of essential breeding behavior. The Corps has agreed to implement a Construction Monitoring Plan for Cape Sable seaside sparrows during construction activities that would minimize disruption to sparrow breeding activities. However, these measures are not sufficient to eliminate all of the adverse impacts to the Sparrow. Therefore, the Service concludes that the **C-111 Project** is likely to cause adverse effects to the Cape Sable seaside sparrow.

Snail Kite, Wood Stork and American Crocodile

The proposed construction sites do not occur within the breeding habitat of the snail kite, wood stork or American crocodile, therefore, no effect on breeding activities is expected. Snail kites and wood storks sometimes forage near the proposed construction sites. However, any disturbance to snail kite or wood stork foraging is anticipated to result in insignificant effects. In addition, since proposed construction sites are not located in any areas designated as critical habitat for the snail kite or American crocodile, no adverse effects to critical habitat are anticipated.

CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, tribal, local or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA.

All future actions that are reasonably certain to occur in the action area and could affect listed species are expected to be carried out, funded and/or permitted by the Corps, National Park Service or U.S. Fish and Wildlife Service. Therefore, all future actions would require separate section 7 consultation and are not subject to evaluation in this biological opinion.

CONCLUSION

After reviewing the current status of the snail kite and its designated critical habitat, wood stork, Cape Sable seaside sparrow and its designated critical habitat, American crocodile and its designated critical habitat, the environmental baseline for the action area, the effects of the proposed **Experimental Program, Modified Water Deliveries** project and **C-111 Project** and the cumulative effects, it is the Service's biological opinion that:

1. the **Experimental Program** is likely to jeopardize the continued existence of the Cape Sable seaside sparrow and adversely modify its critical habitat;

2. the **Experimental Program** is likely to adversely affect, but is not likely to jeopardize the continued existence of the wood stork and the snail kite and is not likely to adversely modify snail kite critical habitat;

3. the **Modified Water Deliveries** project is likely to adversely affect, but is not likely to jeopardize the continued existence of the snail kite, wood stork and American crocodile and is not likely to adversely modify snail kite or American crocodile critical habitat; and,

4. the **C-111 Project** is likely to adversely affect, but is not likely to jeopardize the continued existence of the Cape Sable seaside sparrow and is not likely to adversely modify its critical habitat.

REASONABLE AND PRUDENT ALTERNATIVES

Regulations (50 CFR §402.02) implementing section 7 define reasonable and prudent alternatives (RPAs) as alternative actions, identified during formal consultation, that (1) can be implemented in a manner consistent with the intended purpose of the action, (2) can be implemented consistent with the scope of the action agency's legal authority and jurisdiction, (3) are economically and technologically feasible, and (4) would, the Service believes, avoid the likelihood of jeopardizing the continued existence of listed species or resulting in the destruction or adverse modification of critical habitat. The Service believes that the following RPA can be implemented consistent with the requirements of 50 CFR §402.02.

The RPA outlined below precludes jeopardy to the Cape Sable seaside sparrow by requiring that: (1) By March 1, 1999, a minimum amount of sparrow habitat be protected from unusually high or low water levels; (2) By May 1, 1999, initiate a fire management strategy; (3) By March 1, 2000, increase water levels to reestablish muhly grass as the dominant vegetation within the marl prairies; (4) continue water level increases in 2001 and 2002; (5) By 2003, implement the **Modified Water Deliveries** project; and (6) provide annual reports until the **Modified Water Deliveries** project is implemented.

Reasonable and Prudent Alternative

A single RPA is presented below for the **Experimental Program**. Each of the following points is an integral component of the RPA. Implementation of less than all of these points will not constitute compliance with this RPA.

1) By March 1, 1999, the Corps must ensure the following:

Western Marl Prairies (Subpopulation A)

The Corps must prevent water levels at National Park 205 (NP 205) from exceeding 6.0 feet National Geodetic Vertical Datum (NGVD) for a minimum of 45 consecutive days between March 1 and July 15. This would provide water levels sufficient to allow completion of one nesting cycle in approximately 40 percent of the sparrow habitat in subpopulation A. Although sparrows need at least 40 days to complete one nesting cycle and build new nests for each successive brood, more than 40 days may sometimes be

necessary to complete the cycle when individuals do not find a mate and/or establish a pair bond in the first day. A management scheme that would provide for a nesting period of 45 days would take this possible variation into account, thereby increasing the chances that all breeding pairs would successfully complete one nesting cycle.

An exception to this requirement may be granted if all of the following factors are met and concurred to in writing by the Service: 1) that all other requirements of this RPA have been met; 2) that failure to meet the requirement is due entirely to extraordinary rainfall occurring in the western subpopulation habitat OR that failure to meet the requirement is due entirely to limited structural capacity of the C&SF Project works; and, 3) that the Corps has taken every possible step to anticipate, plan and manage for forecasted rainfall throughout the C&SF Project boundaries, including steps to bring NP 205 water levels down below the target in order to provide a buffer that would allow normal rainfall to occur without bringing NP 205 levels back above the target, and including steps that would lower water levels in the WCAs in order to provide a buffer that would allow forecasted above-average rainfall to be released within structural capacity limitations.

2) By May 1, 1999, or within 60 days of receipt of pertinent information from ENP and GFC, the Corps must ensure the following:

Eastern Marl Prairies (Subpopulations C, E & F)

The Corps must provide additional funding and/or contracted labor to ENP sufficient to provide for: 1) increased fire prevention signing in the East Everglades, Tamiami, Southern Glades , Big Cypress Preserve and main park road areas; 2) eradication of *Casuarina* and other exotic woody vegetation in publicly-owned sparrow habitat areas east of Shark River Slough; and, 3) a symposium on the Cape Sable seaside sparrow and fire management to include all agencies (ENP, Big Cypress Preserve, SFWMD, GFC, USFWS and Florida Department of Forestry) involved in fire management in sparrow habitat areas. This action must be continued until implementation of the **Modified Water Deliveries** project.

ENP will develop detailed proposals and cost estimates for these requirements.

Eastern Marl Prairies (Subpopulation D)

The Corps must provide additional funding and/or contracted labor to GFC, or to ENP with the GFC's permission, sufficient to increase prescribed burning on SFWMD-owned property managed by GFC in the area of sparrow subpopulation D. This action must be continued until implementation of the **Modified Water Deliveries** project.

The Corps must coordinate with GFC to develop detailed proposals and cost estimates for these requirements and must obtain GFC approval of detailed proposals.

3) By March 1, 2000, the Corps must ensure the following:

Western Marl Prairies (Subpopulation A)

The Corps must prevent water levels at NP 205 from exceeding 6.0 feet NGVD for a minimum of 60 consecutive days between March 1 and July 15. This would provide water levels sufficient to allow completion of two nesting cycles in approximately 40 percent of the sparrow habitat in subpopulation A. In understanding this requirement, it is important to note that, due to the topographic variation within the sparrow's habitat, habitat at a higher elevation than the NP 205 reference point will remain dry for longer than habitat at the reference point elevation. Therefore, this requirement will provide the 80 dry days required for completion of two successive broods over a large area of habitat above 6.0 feet NGVD. This action must be continued until implementation of the **Modified Water Deliveries** project.

An exception to this requirement may be granted if all of the following factors are met and concurred to in writing by the Service: 1) that all other requirements of this RPA have been met; 2) that failure to meet the requirement is due entirely to extraordinary rainfall occurring in the western subpopulation habitat OR that failure to meet the requirement is due entirely to limited structural capacity of the C&SF Project works; and, 3) that the Corps has taken every possible step to anticipate, plan and manage for forecasted rainfall throughout the C&SF Project boundaries, including steps to bring NP 205 water levels down below the target in order to provide a buffer that would allow normal rainfall to occur without bringing NP 205 levels back above the target, and including steps that would lower water levels in the WCAs in order to provide a buffer that would allow forecasted above-average rainfall to be released within structural capacity limitations.

Eastern Marl Prairies (Subpopulations C, E & F)

The Corps must implement actions that would produce hydroperiods and water levels in the vicinity of Cape Sable seaside sparrow subpopulations C, E and F, equal to or greater than those that would be produced by implementing the exact provisions of Test 7, Phase II as described in the Final EA for Test 7 (Corps 1995). This action must be continued until implementation of the **Modified Water Deliveries** project.

The Corps must ensure that at least 30 percent of all regulatory water releases (described as the "supplemental regulatory component" in appendix C of the Final EA for Test 7) crossing Tamiami Trail enter ENP east of the L-67 Extension. This target must be measured and met weekly.

An exception to the 30 percent requirement may be granted if all of the following factors are met and concurred to in writing by the Service: 1) that all other requirements of this RPA have been met; 2) that failure to meet the requirement is due entirely to limited structural capacity of the C&SF Project works; and, 3) that the Corps has taken every possible step to anticipate, plan and manage for forecasted rainfall, including steps that would lower water levels in the WCAs in order to provide a buffer that would allow forecasted above-average rainfall to be released within structural capacity limitations.

4) By March 1, 2001, the Corps must ensure the following:

Eastern Marl Prairies (Subpopulations C, E & F)

The Corps must ensure that at least 45 percent of all regulatory water releases (described as the "supplemental regulatory component" in appendix C of the Final EA for Test 7) crossing Tamiami Trail enter ENP east of the L-67 Extension. This target must be measured and met weekly.
An exception to the 45 percent requirement may be granted if all of the following factors are met and concurred to in writing by the Service: 1) that all other requirements of this RPA have been met; 2) that failure to meet the requirement is due entirely to limited structural capacity of the C&SF Project works; and, 3) that the Corps has taken every possible step to anticipate, plan and manage for forecasted rainfall, including steps that would lower water levels in the WCAs in order to provide a buffer that would allow forecasted above-average rainfall to be released within structural capacity limitations.

5) By March 1, 2002, the Corps must ensure the following:

Eastern Marl Prairies (Subpopulations C, E & F)

The Corps must ensure that at least 60 percent of all regulatory water releases (described as the "supplemental regulatory component" in appendix C of the Final EA for Test 7) crossing Tamiami Trail enter ENP east of the L-67 Extension. This target must be measured and met weekly. This action must be continued until implementation of the **Modified Water Deliveries** project.

An exception to the 60 percent requirement may be granted if all of the following factors are met and concurred to in writing by the Service: 1) that all other requirements of this RPA have been met; 2) that failure to meet the requirement is due entirely to limited structural capacity of the C&SF Project works; and, 3) that the Corps has taken every possible step to anticipate, plan and manage for forecasted rainfall, including steps that would lower water levels in the WCAs in order to provide a buffer that would allow forecasted above-average rainfall to be released within structural capacity limitations.

6) The Corps must take all actions necessary to complete full operational implementation of the Modified Water Deliveries project by December, 2003. Implementation of **Modified Water Deliveries** will avoid unusually long periods of flooding in the western marl prairies while providing for additional flooding in the eastern marl prairies.

7) If the Corps determines that land acquisition and/or flowage easement acquisition is necessary in order to meet the above targets, the Corps must ensure that such acquisition is accomplished. Any contributions made by the Department of the Interior could contribute to this goal but the Corps is still obligated to ensure that any necessary acquisition is completed.

8) Implementation of the 9 items in this RPA must be in a way that is consistent with the **Experimental Program's** intended purpose of improving water deliveries through the WCAs south of Alligator Alley and ENP, thereby avoiding adverse impacts to tree islands and other threatened and endangered species and critical habitats. The Service believes the best way to achieve this is to make regulatory releases to Northeast Shark River Slough. When the Corps has the choice between two options for implementing this RPA, one which adversely impacts listed species and/or critical habitat, and one which does not, the Corps should choose the option which does not impact listed species or critical habitat. Excessive water storage in WCA 3, above the current operating schedule, adversely impacts the endangered wood stork, the endangered snail kite, and designated snail kite critical habitat.

9) Until the **Modified Water Deliveries** project is implemented, the Corps must provide an annual report to the Service by September 30th of each year that identifies the following:

   a) The number, acreage, and time-of-year of wildfires that occurred within the marl prairies and the results of implementation of additional fire prevention and suppression measures;*

   b) Results of woody vegetation control supported by the Corps;*

   c) The water release schedule the Corps has implemented to meet water level and flow targets in the eastern marl prairies;

   d) The number of consecutive days between March 1 and July 15 that water levels at NP 205 were below 6.0 feet NGVD;

   e) The number and location of acres acquired and/or the number of acres with flowage easements within the 8.5 square mile area and the Everglades Expansion Area;*

f) The status and timetable for completion of the **Modified Water Deliveries** project components;

g) A description of any additional structures, or changes to existing structure, the Corps plans to make in order to meet RPA targets; and,

h) Any other pertinent information.

* Information required to report on these items will be supplied to the Corps in a timely manner by ENP and GFC for lands under their management.

Because this biological opinion has concluded that the **Experimental Program** is likely to jeopardize the continued existence of the Cape Sable seaside sparrow and adversely modify its critical habitat, the Corps is required to notify the Service in writing of its final decision on the implementation of this reasonable and prudent alternative.

INCIDENTAL TAKE STATEMENT

INTRODUCTION

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, purse, hunt, shoot, wound, kill, trap, capture of collect, or attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing behavioral patterns, including breeding, feeding or sheltering. Harass is defined by the Service as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

The measures described below are non-discretionary, and must be implemented by the Corps so that they become binding conditions of any grant or permit, as appropriate, for the exemption in section 7(o)(2) to apply. The Corps has a continuing duty to regulate the activity covered by this incidental take statement. If the Corps (1) fails to assume and implement the terms and conditions or (2) fails to require other parties to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to permit, grant or other documents, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact

of incidental take, the Corps must report the progress of the action and its impact on the species to the Service as specified in the incidental take statement. [50 CFR §402.14(I)(3)]

AMOUNT OR EXTENT OF TAKE ANTICIPATED

Experimental Program

1. Cape Sable Seaside Sparrow

The Service has developed the following incidental take statement based on the premise that the reasonable and prudent alternative will be implemented. The Service anticipates incidental take of Cape Sable seaside sparrows will be difficult to detect because discovering a dead or impaired specimen is unlikely due to the species' secretive nature. However, the following level of take in the form of harassment, direct or indirect death or harm to individual sparrows is anticipated to result from construction activity, vegetation shifts and fire frequencies that render habitat unsuitable:

Eastern Marl Prairies

The Service anticipates that a maximum of one square mile (640 acres) of habitat annually may be subject to physical disturbance during the nesting season in the vicinity of **Experimental Program** construction activities and the S-332/S-332-D pump discharges. In addition to habitat disturbance, sparrows may also be subject to behavioral disturbance across this area. Water depths rising to greater than 4 inches in the vicinity of nests located near the S-332/S-332-D pump discharges could result in harassment of sparrows occupying nests or harm to the species by significantly disrupting breeding behavior or precluding breeding altogether. Likewise, death or injury to juvenile sparrows or eggs could result from pump discharges that raise the water level above existing nests.

The Corps' Construction Monitoring Plan should provide for avoidance of impacts to the majority of adults, hatchlings or eggs occupying the one square mile. However, due to the species' secretive breeding habits, the Service anticipates that a small percentage of nests would remain undetected. Therefore, hatchlings or eggs would be vulnerable to direct crushing by heavy equipment during construction activities and adult birds would be injured by reduced fecundity associated with nest abandonment. A small percentage of nests located in the area of the S-332/S-332D pump discharges could also be flooded resulting in direct mortality of hatchlings or eggs or injury to adults when rising waters cause nest abandonment that lowers reproductive success. Consequently, the Service anticipates flooding that would result in both physical and behavioral disturbance on 10 percent of the one square mile (64 acres) of suitable habitat that would result in incidental take of individual sparrows annually until implementation of the **Modified Waters Deliveries** project, currently scheduled for 2003.

In determining the number of individual sparrows that may occur across the 64 acres of suitable habitat, the Service noted that peak densities of 20 pairs per 100 acres were measured by Werner (1976) in Taylor Slough and appear near the middle of the range of densities reported for other seaside sparrow subspecies with similar territorial spacing (Norris 1968 and Post 1974). Werner (1975) noted more than a 10-fold variation in breeding density, which may be related to fire extent, fire frequency, and fire mosaic within vegetative communities (Taylor 1983). Since peak densities are estimated at approximately 1 pair per 5 acres, a 10-fold decrease would equate to 1 pair per 50 acres. Recent declines and the current low number estimates for eastern subpopulations C, D, and F likely put these subpopulations at the lower end of known seaside sparrow density estimates. Therefore, the Service anticipates a single pair of Cape Sable seaside sparrows could be taken annually within the 64 acres of suitable habitat expected to be disturbed as a result of the **Experimental Program**. The incidental take is anticipated to be in the form of harm, harassment, and/or death.

Construction impacts are anticipated to occur over a maximum of one nesting season. Once construction is completed, the S-332/332D pump operation could begin. The S-332/S-332D pump discharge impacts are anticipated to begin in the year 2000 and continue to occur over the life of the **Experimental Program** until implementation of the **Modified Water Deliveries** project, currently scheduled for 2003. If more than one square mile of habitat is disturbed annually due to construction and/or S-332/S-332D pump discharges, the Corps has exceeded the incidental take level.

Western Marl Prairies

The Service anticipates that a maximum of 66 square miles of habitat may be subject to flooding during the nesting season in the vicinity of the western subpopulation due to water releases. This area corresponds to 60 percent of suitable Cape Sable seaside sparrow habitat within the western subpopulation area. The adult birds holding territories within the 66 square miles would be injured by water levels too high to allow breeding or lower fecundity associated with nest abandonment. Likewise, death or injury to juvenile sparrows or eggs could result from pump discharges that raise the water level above existing nests. Since 1980 there has been sufficient habitat available during the nesting season for the birds to complete two nesting cycles in six different years. Consequently, the Service anticipates additional incidental take of adult birds in the form of harm or harassment across 44 square miles of habitat that would not remain protected long enough during the nesting season to allow sparrows to complete a second nesting cycle during 1999. These adult birds would be injured by reduced fecundity caused by elevated water levels too high to allow the successful completion of a second nesting cycle or when water depths rise enough to flush brooding adults. Likewise, death or injury to juvenile sparrows or eggs could result from pump discharges that raise the water level above existing nests.

Due to the species' secretive nature and small size, obtaining numerical counts of sparrows that are taken as a result of the **Experimental Program** will be difficult to ascertain. Therefore, the Service anticipates flooding that would result in both physical and behavioral disturbance

resulting in incidental take of individual sparrows across 110 square miles of suitable habitat in 1999 and 66 square miles of suitable habitat annually from 2000-2003, until implementation of the **Modified Waters Deliveries** project.

In determining the number of individual sparrows that may be taken, the 1998 sparrow surveys estimated 192 birds in subpopulation A. The incidental take is expected to be in the form of harassment of adult sparrows occupying nests or harm to the species by significantly disrupting breeding behavior or precluding breeding altogether and/or death of hatchlings or eggs. The adult birds holding territories within the 66 square miles would be injured by water levels too high to allow breeding or lower fecundity associated with nest abandonment. Likewise, death or injury to juvenile sparrows or eggs could result from pump discharges that raise the water level above existing nests. Since water management in 1999 would only guarantee adequate water conditions for one nesting cycle, the **Experimental Program** would impact the sparrow by prohibiting a second nesting cycle. Therefore, the incidental take would be the reproduction of the 192 sparrows during a second nesting cycle. In the year 2000 and subsequent years, until implementation of the **Modified Water Deliveries** project, the Service does not anticipate the **Experimental Program** will incidentally take Cape Sable seaside sparrows.

The determination of no incidental take after 1999 is due to the fact that there is currently an estimated 110 square miles (70,400 acres) of suitable Cape Sable seaside sparrow habitat in the western marl prairies. Although not all 70,400 acres of land may actually be suitable for nesting, the habitat which is suitable for the sparrow is contained within this acreage. The highest recorded population estimate occurred in 1981 when an estimated 2,688 birds occupied the western marl prairies. In 1992 this estimate tallied 2,608, but has been estimated at between 432 and 192 birds ever since. Assuming the availability of suitable habitat in the western marl prairies in 1992 is similar to what is available today, and assuming that all birds are active breeders, which we know is an ideal case, then the habitat currently available in the western marl prairies could support 1,304 pairs or 1 pair per 54 acres. Since a maximum of 66 square miles (42,240 acres) of sparrow habitat would be unavailable each year under this Reasonable and Prudent Alternative until the **Modified Water Deliveries** project is implemented, there remains 44 square miles (28,160 acres) available for sparrow nesting.

The 1998 estimate of sparrows in subpopulation A is 192 birds or, assuming they are all breeding adults, 96 pairs. Since subpopulation A historically contained a density of 1 pair per 54 acres and Werner (1975, 1976) recognized density variability between 1 pair per 5 acres to 1 pair per 50 acres, 96 breeding pairs would need approximately 5,000 acres of suitable habitat for nesting at a density of 1 pair per 50 acres. The Reasonable and Prudent Alternative would result in a minimum of 28,160 acres of suitable nesting habitat. Consequently, the Service does not anticipate the **Experimental Program** will incidentally take the Cape Sable seaside sparrow after the 1999 breeding season because there will be more than 5 times the necessary nesting habitat to support the current number of birds. Furthermore, there is enough sparrow habitat

within the 40 percent (28,160 acres) that will be available until the **Modified Water Deliveries** project is implemented to support 522 pairs or a population of 1,044 birds at a density of 1 pair per 54 acres.

Impacts to the 66 square miles could potentially occur every year until the **Modified Water Deliveries** project is implemented in 2003. If annually more than 66 square miles (42,007 acres) of habitat are unavailable for nesting due to water releases, and if during 1999, less than 44 square miles (28,170 acres) of habitat are available for completion of one nesting cycle, then the Corps has exceeded the incidental take level.

2. Snail kite

The Service has developed the following discussion based on the premise that the reasonable and prudent alternative will be implemented. Although the Service concluded that the snail kite would be adversely effected by the **Experimental Program**, no incidental take of snail kites is anticipated because implementation of the reasonable and prudent alternative will eliminate detrimental deep water levels and long hydroperiods in southern WCA-3A, as water is shifted from WCA-3A to WCA-3B, in order to meet the reasonable and prudent alternatives targets for water releases east of the L-67 extension.

3. Wood Stork

The Service has developed the following incidental take statement based on the premise that the reasonable and prudent alternative will be implemented. The Service anticipates incidental take of wood storks will be difficult to detect because the incidental taking of individual wood storks is likely to be masked by losses due to variable rainfall, heat and wind conditions that alter evapotranspiration, vegetation changes, human-induced water management actions and antecedent conditions, which all contribute to changing water levels. However, the following incidental take in the form of harm to wood storks is anticipated to result from reduced hydroperiods and water levels that impair essential foraging and nesting patterns. This incidental take is anticipated to occur annually until implementation of the **Modified Water Deliveries** project, currently scheduled for 2003.

Wood storks attempting to nest in the action area have experienced reduced hydroperiods and water levels in their breeding habitat since the C&SF project was implemented and will continue to experience these same conditions as a result of the **Experimental Program**. During the wet season wood storks require a lengthening hydroperiod to produce enough fish biomass such that during the dry or breeding season, as the water recedes, it concentrates fish at densities to sustain storks as they nest and rear their young. Too short a hydroperiod fails to produce the necessary fish biomass or, if water recedes too slowly, provide available concentrations of fish to sustain adult storks resulting in nest abandonment. The majority of recent and historical stork nesting colonies in the action area are located in the Shark Slough estuaries, with a few located in the Taylor Slough estuaries. Due to it's specialized feeding method, the reproductive success of the

wood stork corresponds to the availability of specific foraging conditions, as feeding areas proximal to wood stork breeding colonies likely play an important role in chick survival. Lower than optimal water levels in foraging habitat will preclude fish concentrations at densities suited to the wood stork's specialized feeding behavior, thereby creating unfavorable nesting conditions. In addition, reduced water levels below optimal conditions during the nesting season will cause injury to the wood stork by reducing forage efficiency that impairs nesting and the ability of the adults to successfully rear young.

Due to the number of variables affecting water levels that determine the availability of suitable nesting conditions, accurately obtaining the precise number of wood storks that are harmed by the **Experimental Program** is not possible. Therefore, the Service anticipates the **Experimental Program** will result in habitat modification or degradation which can be measured by actual annual average water flow into wood stork nesting habitat and by the hydroperiod duration in Shark Slough. Ogden (1998) identified two hydrological indicators which best measure the recovery of optimum foraging conditions for storks: (a) the measures of volume of flows into the mainland estuaries downstream from the southern Everglades, which includes two flow lines: one across the southern Shark Slough and the other across the southern Taylor Slough; and (b) the measure of the mean duration of uninterrupted surface hydroperiod in central and southern Shark Slough. If the actual uninterrupted surface hydroperiod in Shark Slough for a given year, as measured at P-33 (or other measurement method agreeable to the Service and the Corps) is shorter than modeled for a similar year in the hydrologic period of record, the Corps will have exceeded the incidental take level. Table 1 provides the Van Lent et al. (1999) modeled average hydroperiod for indicator regions 9 and 10 for comparison. In recognition of the substantive questions that have been raised by the Corps concerning the Van Lent et al. (1999) modeling, if future modeling is developed that is agreeable to both the Corps and the Service, the Service would consider that to be new information that may warrant a reexamination of this incidental take statement. However, until such new modeling is developed, the Service has determined that the Van Lent et al. (1999) modeling is the best scientific information currently available because it is the only published, peer reviewed, modeling information of a sufficiently detailed nature to make the required determinations.

Table 1. Summary of modeling results from Van Lent *et al.* (1999) used to measure incidental take.

Proposed Action	Average weeks of innundation for IR 9	Average weeks of innundation for IR 10	Frequency of January-April IR 14 dryouts	Frequency of dryouts ≥ 30 days
Experimental Program (7, II)	52	66	N/A	N/A
Modified Water Deliveries	49.5	54.6	0.10	0.13

Modified Water Deliveries:

1. Snail Kite

The Service anticipates incidental take of snail kites will be difficult to detect because the taking of individual snail kites is likely to be masked by losses due to variable rainfall, heat and wind conditions that alter evapotranspiration, vegetation changes, human-induced water management actions and antecedent conditions, which all contribute to changing water levels. However, incidental take in the form of harm to snail kites is anticipated to result from longer hydroperiods with deep water which impair essential foraging and nesting patterns. This incidental take is anticipated to occur annually until implementation of the Restudy Project, currently scheduled for 2050.

Habitat conditions suitable for snail kites require a balanced approach to water management. Prolonged drying of wetlands, especially in an impounded area with little variation in water depth, can cause local depletion of apple snails. Low water during the nesting season also forces snail kites to nest on poor quality sites, where marginal nesting substrate results in greater nest structure collapse, increases vulnerability to human disturbance, predation and lowers nesting success. Conversely, prolonged periods of high water levels drown out woody vegetation required for successful nesting and by creating deep pool conditions in marsh vegetation that result in unsuitable habitat conditions for effective snail kite foraging. Bennetts and Kitchens (1997) noted that continuous flooding without periodic drying results in a loss of tree islands and other woody vegetation used by snail kites for nesting as well as a loss of foraging habitat. Snail kites initiate nesting when habitat conditions are favorable, however, the **Modified Water Deliveries** project will maintain longer hydroperiods with deep impounded pools. These conditions will injure snail kites by significantly impairing essential nesting and foraging patterns which results in lower fecundity.

Due to the number of variables affecting water levels that determine the availability of suitable nesting conditions, accurately obtaining the precise number of snail kites that are harmed by the **Modified Water Deliveries** project is not possible. Therefore, the Service anticipates the **Modified Water Deliveries** project will result in habitat modification or degradation which can be measured by the frequency and duration of dry-outs occurring between January and April. If the frequency of dry-outs occurring between January and April within Indicator Region 14 (Southern WCA-3A) and the frequency of dry-outs lasting longer than 30 days, used in the ENP analysis for snail kites (Van Lent et al. 1999) are higher than modeled (Table 1), the Corps will have exceeded the incidental take level. The occurrence of dryouts will be measured at G-65 (or other measurement point agreeable to both the Service and the Corps), and will be compared to the modeled frequency as a 5-year running average. In recognition of the substantive questions that have been raised by the Corps concerning the Van Lent et al. (1999) modeling, if future modeling is developed that is agreeable to both the Corps and the Service, the Service would consider that to be new information that may warrant a reexamination of this incidental take statement. However, until such new modeling is developed, the Service has determined that the

Van Lent et al. (1999) modeling is the best scientific information currently available because it is the only published, peer reviewed, modeling information of a sufficiently detailed nature to make the required determinations.

2. Wood Stork

The Service anticipates incidental take of wood storks will be difficult to detect because the incidental taking of individual wood storks is likely to be masked by losses due to variable rainfall, heat and wind conditions that alter evapotranspiration, vegetation changes, human-induced water management actions and antecedent conditions, which all contribute to changing water levels. However, the following incidental take in the form of harm to wood storks is anticipated to result from reduced hydroperiods and water levels that impair essential foraging and nesting patterns. This incidental take is anticipated to occur annually until implementation of the Restudy Project, currently scheduled for 2050.

Wood storks attempting to nest in the action area have experienced reduced hydroperiods and water levels in their breeding habitat since the C&SF project was implemented and will continue to experience these same conditions as a result of the **Modified Water Deliveries** project.

During the wet season wood storks require a lengthening hydroperiod to produce enough fish biomass such that during the dry or breeding season, as the water recedes, it concentrates fish at densities to sustain storks as they nest and rear their young. Too short a hydroperiod fails to produce the necessary fish biomass or, if water recedes too slowly, provide available concentrations of fish to sustain adult storks resulting in nest abandonment. The majority of recent and historical stork nesting colonies in the action area are located in the Shark Slough estuaries, with a few located in the Taylor Slough estuaries. Due to it's specialized feeding method, the reproductive success of the wood stork corresponds to the availability of specific foraging conditions, as feeding areas proximal to wood stork breeding colonies likely play an important role in chick survival. Lower than optimal water levels in foraging habitat will preclude fish concentrations at densities suited to the wood stork's specialized feeding behavior, thereby creating unfavorable nesting conditions. In addition, water levels below optimal conditions during the nesting season will cause injury to the wood stork by reducing forage efficiency that impairs nesting and the ability of the adults to successfully rear young.

Due to the number of variables affecting water levels that determine the availability of suitable nesting conditions, accurately obtaining the precise number of wood storks that are harmed by the **Modified Water Deliveries** project is not possible. Therefore, the Service anticipates the **Modified Water Deliveries** project will result in habitat modification or degradation which can be measured by actual annual average water flow into wood stork nesting habitat and by the hydroperiod duration in Shark Slough - see below. Ogden (1998) identified two hydrological indicators which best measure the recovery of optimum foraging conditions for storks: (a) the measures of volume of flows into the mainland estuaries downstream from the southern Everglades, which includes two flow lines: one across the southern Shark Slough and the other

across the southern Taylor Slough; and (b) the measure of the mean duration of uninterrupted surface hydroperiod in central and southern Shark Slough. If the actual uninterrupted surface hydroperiod in Shark Slough for a given year, as measured at P-33 (or other measurement method agreeable to the Service and the Corps) is shorter than modeled for a similar year in the hydrologic period of record, the Corps will have exceeded the incidental take level. Table 1 provides the Van Lent et al. (1999) modeled average hydroperiod for indicator regions 9 and 10 for comparison. In recognition of the substantive questions that have been raised by the Corps concerning the Van Lent et al. (1999) modeling, if future modeling is developed that is agreeable to both the Corps and the Service, the Service would consider that to be new information that may warrant a reexamination of this incidental take statement. However, until such new modeling is developed, the Service has determined that the Van Lent et al. (1999) modeling is the best scientific information currently available because it is the only published, peer reviewed, modeling information of a sufficiently detailed nature to make the required determinations.

3. American Crocodile

The Service anticipates incidental take of American crocodiles will be difficult to detect because of the remoteness of the crocodile's habitat and difficulty observing cryptic hatchling crocodiles. However, the following incidental take in the form of harm to American crocodiles is anticipated to result from increased salinity levels that impair essential breeding patterns. This incidental take is anticipated to occur annually until implementation of the Restudy Project, currently scheduled for 2050.

Water salinity affects habitat use by crocodiles and may be locally important, especially during periods of low rainfall. Adult crocodiles are injured by high salinity habitats that cause crocodile hatchlings to experience decreased growth and survival rates which would result in lower adult reproductive efficiency or genetic fitness for those individuals that survive. The evolutionary success of genetic traits, through the process of natural selection, is directly related to the species' survival or viability. High salinity habitats increase osmoreulatory stress to crocodile hatchlings which are forced to leave protective cover and become exposed to high predation rates. This decrease in survival rate not only lowers the frequency of the parent genotype in the population but its ability to persist and be expressed in future generations.

Due to the number of variables affecting freshwater conditions in South Florida, including tropical storms, hurricanes, frequency of rainfall and anthropogenic factors, accurately obtaining the precise number of crocodiles that are harmed by the **Modified Water Deliveries** project is not possible. Mazzotti (1996) indicates there were approximately 20 crocodile nests in Florida Bay in 1994 and 1995. The nesting success ranged from approximately 45 to 70 percent. Using these numbers and a 90 percent viability for the eggs and an average of 38 eggs per nest, there would be approximately 300 to 475 hatchlings in Florida Bay. Without additional data on the distribution of the salinity wedge with respect to nest locations, we assume that all hatchlings will be taken by the higher salinities as a result of **Modified Waters Deliveries**. The locating or actual counting of death to specific individuals is not possible because of the secretive nature of

the hatchlings. Since the Service believes this incidental take is the result of high salinities, the level of incidental take will be monitored by the spatial extent and duration of salinity levels exceeding 40 parts per thousand in Florida Bay mangrove fringe nursery habitats during the August-November hatchling period. The Service will conclude that this anticipated level of incidental take has been exceeded if salinity monitoring shows that the spatial extent and duration of salinity levels exceeding 40 parts per thousand in Florida Bay nursery habitats during the August-November hatchling period increases beyond increases expected to occur as a result of reductions in actual uninterrupted surface hydroperiod in Shark Slough for a given year. Uninterrupted surface hydroperiod is directly related to the volume of water flow and, therefore, serves as an indirect measure of expected salinity. Uninterrupted surface hydroperiod will be measured at P-33 (or other measurement method agreeable to the Service and the Corps) and if the actual measure for a given year is shorter than modeled for a similar year in the hydrologic period of record, the Corps will have exceeded the incidental take level. Table 1 provides the Van Lent et al. (1999) modeled average hydroperiod for indicator regions 9 and 10 for comparison. (Table 1). In recognition of the substantive questions that have been raised by the Corps concerning the Van Lent et al. (1999) modeling, if future modeling is developed that is agreeable to both the Corps and the Service, the Service would consider that to be new information that may warrant a reexamination of this incidental take statement. However, until such new modeling is developed, the Service has determined that the Van Lent et al. (1999) modeling is the best scientific information currently available because it is the only published, peer reviewed, modeling information of a sufficiently detailed nature to make the required determinations.

C-111 Project:

1. Cape Sable seaside sparrow

The Service anticipates incidental take of Cape Sable seaside sparrows will be difficult to detect because discovering a dead or impaired specimen is unlikely due to the species' secretive nature and observability difficulty. However, the following level of take in the form of harassment, direct death or indirect death or harm to individual sparrows is anticipated to result from construction activity.

The Service expects that a maximum of one square mile (640 acres) of habitat may be subject to physical disturbance during the nesting season in the vicinity of C-111 Project construction activities. This incidental take may occur over several years, but the Service does not anticipate that the total disturbance will exceed 640 acres, regardless of the duration of construction activities. In addition to habitat disturbance, sparrows may also be subject to behavioral disturbance across this area.

The Corps' Construction Monitoring Plan should provide for avoidance of impacts to the majority of adults, hatchlings or eggs occupying the one square mile. However, due to the species' secretive breeding habits, the Service expects that a small percentage of nests would remain undetected and, therefore, hatchlings or eggs would be vulnerable to direct crushing by heavy equipment during construction activities or nest abandonment by the adult birds. As a result of nest abandonment, the adult birds would be injured by the significant impairment of their reproductive patterns. Consequently, the Service anticipates physical and behavioral

disturbance on 10 percent of the one square mile (64 acres) of suitable habitat that would result in incidental take of individual sparrows annually until construction is complete.

Peak densities of 20 pairs per 100 acres were measured by Werner (1976) in Taylor Slough and appear near the middle of the range of densities reported for other seaside sparrow subspecies with similar territorial spacing (Norris 1968 and Post 1974). Werner (1975) noted more than a 10-fold variation in breeding density, which may be related to fire extent, fire frequency, and fire mosaic within vegetative communities (Taylor 1983). Since peak densities are estimated at approximately 1 pair per 5 acres, a 10-fold decrease would equate to 1 pair per 50 acres. Recent declines and the current low number estimates for eastern subpopulations C, D, and F likely put these subpopulations at the lower end of known seaside sparrow density estimates. Therefore, the Service anticipates a single pair of Cape Sable seaside sparrows could be taken annually within the 10 percent suitable habitat (64 acres) expected to be disturbed as a result of the C-111 Project. The incidental take is expected to be in the form of harm, harassment, and/or death. If annually more than one square mile of habitat is disturbed due to construction associated with the C-111 Project, the Corps has exceeded the incidental take level.

A summary of anticipated incidental take and measures for determining when this level of take has been exceeded is provided in Table 2.

Table 2. Summary of Incidental Take Identified for Modified Water Deliveries, Experimental Water Deliveries, and Canal 111 Projects with Implementation of the Reasonable and Prudent Alternative.

	EXPERIMENTAL PROGRAM	MODIFIED WATER DELIVERIES	CANAL - 111 PROJECT
CAPE SABLE SEASIDE SPARROW (Eastern)	Incidental take from the disturbance of 64 Acres of habitat per year through 2003.	No incidental take	Incidental take from the disturbance of 64 Acres of habitat per year not to exceed 640 acres for the project.
CAPE SABLE SEASIDE SPARROW (Western)	Incidental take as a result of reduced reproduction from high water on 66 square miles of habitat through 2003. This level is exceeded if more the 66 square miles of habitat are subjected to high water.	No incidental take	No incidental take
WOOD STORK	Incidental take because of reduced reproduction from reduced hydroperiods in Shark River and Taylor sloughs through 2003. This level would be exceeded if actual average hydroperiod is less than modeled for a similar year in the period of record.	Incidental take because of reduced reproduction from reduced hydroperiods in Shark River and Taylor sloughs through 2050. This level would be exceeded if actual average hydroperiod is less than modeled for a similar year in the period of record.	
SNAIL KITE	No incidental take	Incidental take because of reduced reproduction as a result of high water conditions. The incidental take will be exceeded if the frequency of dry-outs lasting 30 or more days is less than 0.13 through 2050.	
AMERICAN CROCODILE	No incidental take	Incidental take of hatchlings and eggs due to increased salinity in Florida Bay. The incidental take will be exceeded if the salinity exceeds 40 parts per thousand more frequently than projected in the modeling.	

D97

EFFECT OF THE TAKE

Experimental Program:

1. Cape Sable Seaside Sparrow

The effect to adult sparrows in the western marl prairies is expected to be reduced fecundity of birds in high precipitation years due to managed water releases which would reduce the availability of 60 percent of suitable breeding habitat. In addition, direct take of hatchlings or eggs is anticipated due to nest sites located in the areas of S-12 pump discharges. In the accompanying biological opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to the species or destruction or adverse modification of critical habitat when the reasonable and prudent alternative is implemented. As part of this alternative, the Corps must ensure water levels in 40 percent of the western marl prairies are sufficient to allow completion of one nesting cycle in 1999 and two nesting cycles thereafter until implementation of the **Modified Water Deliveries** project, currently scheduled for implementation in 2003.

The effect to adult sparrows in the eastern marl prairies is expected to be reduced fecundity of birds located across 64 acres near the S-332/S-332D pump discharges due to rising water levels which reduce availability of suitable breeding habitat. In addition, direct take of hatchlings or eggs is anticipated due to nest sites located within the 64 acres near construction activity and/or pump discharges. In the accompanying biological opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to the species or destruction or adverse modification of critical habitat when the reasonable and prudent alternative is implemented. Current density estimates indicate only a single pair of sparrows is likely be taken in the area of anticipated disturbance.

2. Wood Stork

The effect to wood storks is expected to be reduced fecundity of some individuals through habitat modification or degradation measured by annual average flow and hydroperiod duration in Shark Slough. In the accompanying biological opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to the species when the reasonable and prudent alternative is implemented. The majority of nesting by the southeastern wood stork population no longer occurs in South Florida as wood storks in the southeast have responded to changing environmental conditions through temporal relocation.

Modified Water Deliveries:

1. Snail Kite

The effect to snail kites is expected to be reduced fecundity of some individuals through habitat modification or degradation measured by the frequency and duration of dry-outs occurring

between January and April. In the accompanying biological opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to the species or destruction or adverse modification of critical habitat. Snail kites are nomadic in response to water depth, hydroperiod, food availability, nutrient loads, and other habitat changes (Bennetts *et al.* 1994). Snail kites likely minimize the effect of poor localized habitat conditions by their ability to move long distances across a mosaic of suitable wetland habitats within the landscape.

2. Wood Stork

The effect to wood storks is expected to be reduced fecundity of some individuals through habitat modification or degradation measured by annual average flow and hydroperiod duration in Shark Slough. In the accompanying biological opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to the species when the reasonable and prudent alternative is implemented. The majority of nesting by the southeastern wood stork population no longer occurs in South Florida as wood storks in the southeast have responded to changing environmental conditions through temporal relocation.

3. American Crocodile

The effect to American crocodile is expected to be lower adult reproductive efficiency or genetic fitness through habitat modification or degradation measured by the spatial extent and duration of salinity levels exceeding 40 parts per thousand in Florida Bay mangrove fringe nursery habitats during the August-November hatchling period. In the accompanying biological opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to the species or destruction or adverse modification of critical habitat when the reasonable and prudent alternative is implemented. The affected area represents only a small portion of the species' available nesting habitat in addition to the fact that the American crocodile in South Florida has increased substantially over the last 20 years with the number of reproductively active females more than doubling.

C-111 Project:

Cape Sable Seaside Sparrow

The effect to adult sparrows in the eastern marl prairies is expected to be reduced fecundity of birds in the vicinity of the C-111 Project construction activities due to nest abandonment. In addition, mortality of hatchlings or eggs is anticipated due to direct crushing of nests in the vicinity construction activities. In the accompanying biological opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to the species or destruction or adverse modification of critical habitat when the reasonable and prudent alternative is implemented. Current density estimates indicate only a single pair of sparrows is likely be taken in the area of anticipated disturbance.

REASONABLE AND PRUDENT MEASURES

The Service believes the following reasonable and prudent measures are necessary and appropriate to minimize impacts of incidental take:

Experimental Program:

1. Timing and volume of pumping at S-332 and S-332D must be balanced to minimize vegetation community change and flooding impacts to Cape Sable seaside sparrow habitat while providing as much benefit to Taylor Slough hydrology as possible. Flows should be distributed as evenly as possible across Cape Sable seaside sparrow habitat in this area to avoid over-drying or over-wetting particular areas. This will minimize incidental take by minimizing the amount of breeding habitat rendered unsuitable by over-dry or over-wet conditions.

2. Prior to March 1, 1999, a burn management strategy must be implemented to reduce the risk of fire that could harm Cape Sable seaside sparrows in the area occupied by subpopulation B.

3. Prior to February 15, 2000, water management operations affecting WCA 3 must be adjusted to reduce adverse impacts to wood storks as much as possible without increasing adverse effects to the Cape Sable seaside sparrow. This should include measures to increase flow volumes delivered to wood stork nesting habitats at the Florida Bay/mangrove interface. This will minimize incidental take by minimizing loss of fish populations that provide wood stork foraging resources.

Modified Water Deliveries:

Water management operations must be adjusted to decrease adverse impacts to snail kites, wood storks and American crocodiles. This should include measures to increase flow between WCA 3B and Northeast Shark River Slough and measures to increase conveyance of water through Shark River Slough and into Florida Bay. This will minimize incidental take of snail kites and wood storks by reducing high water levels in WCA 3B that render foraging habitats unsuitable. Incidental take of wood storks will also be minimized through reductions in the number of years in which foraging habitats are not available near Florida Bay nesting areas. Incidental take of American crocodiles will be minimized through reductions in the number of years in which hatchlings habitats affording cover from predators are unavailable due to high salinities.

C-111 Project:

Because the Corps has already agreed to implement a Construction Monitoring Program in conjunction with construction activities that the Service believes will minimize

anticipated adverse effects to Cape Sable seaside sparrows, no further reasonable and prudent measures or terms and conditions are required. The Construction Monitoring Program will minimize incidental take of Cape Sable seaside sparrows through reductions in the number of days that intrusive construction activities will take place in occupied breeding habitats.

The Service believes that these reasonable and prudent measures are reasonable, that they cause only minor changes to the project, and that they are within the legal authority and jurisdiction of the Corps to carry out.

TERMS AND CONDITIONS

In order to be exempt from the prohibitions of section 9 of the Act, the Corps must comply with the following terms and conditions, which implement the reasonable and prudent measures described above and outline required reporting/monitoring requirements. These terms and conditions are non-discretionary.

Experimental Program:

1. Because available information does not allow for a precise determination of effects of pumping at S-332 and S-332D, the Corps must ensure that pumping at S-332D and S-332 is initially limited to no more than a total of 165 cfs for both structures to the maximum extent possible during the Cape Sable seaside sparrow breeding season (March 1 - July 15).

2. The Corps, in consultation with the Service, ENP, GFC and SFWMD, must decide on precise operational rules for S-332 and S-332D and develop precise modeling information sufficient to determine the actual effects of the proposed operations on Cape Sable seaside sparrow habitat and individuals. Based on this information, the Corps may consult with the Service to determine whether a change in the initial 165 cfs limit is warranted.

3. The Corps must provide additional funding and/or contracted labor to ENP sufficient to provide for: 1) increased fire prevention signing in the East Everglades, Tamiami, Southern Glades, Big Cypress Preserve and main park road areas; and 2) sponsor a symposium on the Cape Sable seaside sparrow and fire management to include all agencies (ENP, Big Cypress Preserve, SFWMD, GFC, USFWS, and Florida Department of Forestry) involved in fire management in sparrow habitat areas.

4. The Corps must ensure that monitoring and research programs sufficient to track the nature, amount and extent of any take of Cape Sable seaside sparrow or wood stork individuals resulting from implementation of the RPA are in place by January 1, 2000, and are continued for the life of the **Experimental Program**. This would include, but is

not limited to: 1) tracking the yearly status of Cape Sable seaside sparrow and wood stork populations and any vegetative shifts that may occur within Cape Sable seaside sparrow habitats; and, 2) determining the number of wood storks initiating nesting in the action area and the success rate of those nesting efforts each year.

5. Upon locating a dead, injured, or sick individual of an endangered or threatened species, initial notification must be made to the Fish and Wildlife Service Law Enforcement Office at 10426 N.W. 31 Terrace, Miami, FL 33172, (305)526-2610. Additional notification must be made to the Fish and Wildlife Service South Florida Restoration Projects Office at 1360 U.S. Hwy 1, Suite 5, Vero Beach, FL 32960, (561)778-0896. Care should be taken in handling sick or injured individuals and in the preservation of specimens in the best possible state for later analysis of cause of death or injury.

Modified Water Deliveries:

1. The Corps must, in cooperation with the Service, GFC, ENP, SFWMD and other appropriate groups, explore ways to increase freshwater flows through Taylor Slough and into northeast Florida Bay.

2. The Corps must, in cooperation with the Service, GFC, ENP, SFWMD and other appropriate groups, explore ways to increase flows from WCA 3B to Northeast Shark River Slough.

3. The Corps must ensure that monitoring and research programs are sufficient to: 1) track the yearly status of the wood stork, snail kite and American crocodile populations and any vegetative shifts that may occur within snail kite habitats; 2) determine the number of wood storks snail kites and American crocodiles initiating nesting in the action area and the success rate of those nesting efforts each year; 3) monitoring the spatial extent and status of snail kite nesting substrates in southern WCA-3B; and, 4) determine actual and expected flow volumes entering Florida Bay and the Shark Slough estuarine areas. These research efforts must be in place two years prior to final **Modified Water Deliveries** project implementation and must continue for the life of the project. A research plan must be submitted to the Service for approval prior to implementation.

4. Upon locating a dead, injured, or sick individual of an endangered or threatened species, initial notification must be made to the Fish and Wildlife Service Law Enforcement Office at 10426 N.W. 31 Terrace, Miami, FL 33172, (305)526-2610. Additional notification must be made to the Fish and Wildlife Service South Florida Restoration Projects Office at 1360 U.S. Hwy 1, Suite 5, Vero Beach, FL 32960, (561)778-0896. Care should be taken in handling sick or injured individuals and in the preservation of specimens in the best possible state for later analysis of cause of death or injury.

The reasonable and prudent measures, with their implementing terms and conditions, are designed to minimize the impact of incidental take that might otherwise result from the proposed actions. If, during the course of the action, this level of incidental take is exceeded, such incidental take represents new information requiring reinitiation of consultation and review of the reasonable and prudent measures provided. The Federal agency must immediately provide an explanation of the causes of the taking and review with the Service the need for possible modification of the reasonable and prudent measures.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information. The Service offers the following conservation recommendations for the proposed actions.

Experimental Program:

1. The Corps, in cooperation with ENP, U.S. Geological Survey, Biological Resources Division (USGS-BRD) and other appropriate groups, should gather and provide the Service with elevation data for the areas of Cape Sable seaside sparrow subpopulations B-F sufficient to allow individual-based modeling of these subpopulations as described by the Institute for Environmental Modeling and USGS-BRD (1998).

2. For Cape Sable seaside sparrow habitats within the Rocky Glades, East Everglades and Taylor Slough, the Corps, in cooperation with the Service, ENP and GFC, should eliminate exotic and woody vegetation within historically occupied sparrow habitat.

Modified Water Deliveries Project:

Using additional information and insights on Everglades restoration techniques developed during the C&SF Restudy planning process, the Corps, in cooperation with other appropriate groups, should redesign the **Modified Water Deliveries** project to increase the restoration of natural flow patterns and volumes which benefit listed species while accomplishing Everglades restoration objectives.

C-111 Project:

In designing future detailed construction and operation schedules for **C-111 Project** features, the Corps should coordinate with the Service, ENP, GFC and other appropriate groups to ensure these designs optimize restoration of natural flow patterns and volumes which benefit listed species.

In order for the Service to be kept informed of actions minimizing or avoiding adverse effects or benefitting listed species or their habitats, the Service requests notification of the implementation of any conservation recommendations.

REINITIATION NOTICE

This concludes formal consultation on the actions outlined in the Corps's November 4, 1997, request for reinitiation of consultation. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary CORPS involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the CORPS' action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the CORPS' action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

Sincerely,

FOR Sam D. Hamilton
Regional Director

LITERATURE CITED

Ackerman, B.B., S.D. Wright, R.K. Bonde, C.A. Beck, and D.J. Banowetz. 1995. Analysis of watercraft-related mortality of manatees in Florida, 1979-1991. Pages 259-268 in T.J. O'Shea, B.B. Ackerman, and H.F. Percival, eds. Population biology of the Florida manatee: Information and Technology Report I. U.S. Department of the Interior, National Biological Service; Washington, D.C.

Anderson, W. 1942. Rediscovery of the Cape Sable seaside sparrow in Collier County. Florida Naturalist 16:12.

Armentano, T.V., R.F. Doren, W.J. Platt and T. Mullins. 1995. Effects of Hurricane Andrew on coastal and interior forests of southern Florida: overview and synthesis. J. Coastal Res. Spec. Issue No. 21:111-144.

Austin, D.F. and C.E. Nauman. 1981. Status report on *Chamaesyce garberi*. Unpublished report to the U.S. Fish and Wildlife Service; Jacksonville, Florida.

Bancroft, G.T., W. Hoffman, R.J. Sawicki and J.C. Ogden. 1992. The importance of the Water Conservation Areas in the Everglades to the endangered wood stork (*Mycteria americana*). Conservation Biology 6:392-398.

Bass, O.L. 1998. Personal communication. Biologist. Everglades National Park. Homestead, Florida.

Bass, O.L., Jr. and J.A. Kushlan. 1982. Status of the Cape Sable sparrow. U.S. Department of the Interior, National Park Service, South Florida Research Center Report T-672; Homestead, Florida.

Beeler, I.E. and T.J. O' Shea. 1988. Distribution and mortality of the West Indian manatee (*Trichechus manatus*) in the southeastern United States: a compilation and review of recent information. Report prepared by the U.S. Fish and Wildlife Service for the U.S. Army Corps of Engineers. PB 88-207 980/AS. National Technical Information Service; Springfield, Virginia.

Beever, J.W. III and K.A. Dryden. 1992. Red-cockaded woodpeckers and hydric slash pine flatwoods. Transactions of the North American Wildlife and Natural Resources Conference. 57:693-700.

Beissinger, S.R. 1986. Demography, environmental uncertainty, and the evolution of mate desertion in the snail kite. Ecology 67: 1445-1459.

Beissinger, S. R. 1988. Snail kite. Pages 148-165 *in* R. S. Palmer, eds. Handbook of North American birds, Vol. 4, Yale University Press, New Haven, Connecticut.

Belden, R.C., W.B. Frankenberger, R.T. McBride, and S.T. Schwikert. 1988. Panther habitat use in southern Florida. Journal of Wildlife Management 52(4):660-663.

Bennetts, R.E. and W.M. Kitchens. 1997. The Demography and Movements of Snail Kites in Florida. Technical Report Number 56. USGS-BRD, Florida Cooperative Fish & Wildlife Research Unit.

Bennetts, R.E., M.W. Collopy and J.A. Rodgers, Jr. 1994. The Snail Kite in the Florida Everglades: A Food Specialist in a Changing Environment. *In* Everglades: the ecosystem and its restoration. pp. 419-444. Davis, S.M. and J.C. Ogden, *eds*. St. Lucie Press, Delray Beach, Florida.

Bent, A. C. 1937. Life histories of North American birds of prey. U.S. National Museum Bulletin 167.

Bogert, C.M. and R.B. Cowles. 1947. Results of the Archbold expeditions. No. 58. Moisture loss in relation to habitat selection in some Floridian reptiles. American Museum of Novitates 1358:1-55.

Bowman, R., and J.W. Fitzpatrick. 1993. Florida scrub jay and red-cockaded populations at the Avon park Air Force Range. Final report. Department of Defense, Avon Park, Florida.

Broley, C.L. 1947. Migration and nesting of Florida bald eagles. Wilson Bulletin 59:3-20.

Browder, J.S. 1984. Wood stork feeding areas in southwest Florida. Florida Field Naturalist 12:81-96.

Costa, R., and J.L. Walker. 1995. Red-cockaded woodpecker. Pages 86-89 *in* E. T. LaRoe, G.S. Farris, C.E. Puckett, and others, eds. Our living resources: a report to the nation on the distribution, abundance, and health of U.S. plants, animals, and ecosystems. U.S. Natl. Biol. Serv., Washington, D.C.

Coulter, M.C. 1987. Foraging and breeding ecology of wood storks in east-central Georgia. Pages 21-27 *in* R.R. Odom, KA. Riddleberger, and J.C. Ozier, eds. Proceedings of the Third Southeastern Nongame and Endangered Wildlife Symposium. Georgia Department of Natural Resources; Atlanta, Georgia.

Coulter, M.C., and A.L. Bryan, Jr. 1993. Foraging ecology of wood storks (*Mycteria americana*) in east-central Georgia: Characteristics of Foraging Sites. Colonial Waterbirds 16:59-70.

Cox, J., W.W. Baker, and D. Wood. 1995. Status, distribution, and conserva tion of the red-cockaded woodpecker in Florida: a 1992 update. Pages 457-464 *in* D.L. Kulhavey, R.G. Hooper, and R. Costa, eds. Red-cockaded woodpecker: recovery, ecology, and manage ment. Center for Applied Studies in Forests, College of Forestry, Stephen F. Austin State University; Nacogdoches, Texas.

Curnutt, J.L. 1996. Southern bald eagle. Pages 179-187 *in*: J.A. Rodgers Jr., H.W. Kale II, H.T. Smith, eds. Rare and Endangered Biota of Florida, University Press of Florida; Gainesville, Florida.

Curnutt, J.L. 1998. Personal communication. Biologist. Department of Biology, University of Tennessee, Knoxville.

Curnutt, J.L. and S.L. Pimm. 1993. Status and ecology of the Cape Sable seaside sparrow. Unpublished report prepared for the U.S. Fish and Wildlife Service and the National Park Service; Vero Beach, Florida.

Curnutt, J.L and W.B. Robertson, Jr. 1994. Bald eagle nest site characteristics in south Florida. Journal of Wildlife Management 58(2):218-221.

Curnutt, J.L., A.L. Mayer, T.M. Brooks, L. Manne, O.L. Bass Jr., D.M. Flemming, M.P. Nott and S.L. Pimm. 1998. Population dynamics of the endangered Cape Sable seaside sparrow. Animal Conservation 1, 11-21.

Dean, T.F. and J.L. Morrison. 1998. Non-breeding season ecology of the Cape Sable seaside sparrow (*Ammodramus maritimus mirabilis)*: 1997-1998 field season final report. Unpublished report submitted to the U.S. Fish and Wildlife Service.

DeSola, C.R. 1935. Herpetological notes from southeastern Florida. Copeia 1935(1):44-45.

Diemer, J.E., and D.W. Speake. 1981. The status of the eastern indigo snake in Georgia. Pages 52-61 *in* R. Odum and J. Guthrie, eds. Proceedings of the Nongame and Endangered Wildlife Symposium, Georgia Department of Natural Resources, Game and Fish Division, Technical Bulletin WL 5.

Ehrenfeld, J. 1976. Reproductive biology of three species of *Euphorbia* subgenus *Chamaesyce* (Euphorbiaceae). American Journal of Botany 63(4):406-413.

Ehrenfeld, J. 1979. Pollination of three species of Euphorbia subgenus *Chamaesyce*, with special reference to bees. American Midland Naturalist 101(1):87-98.

Ehrlich, P.R., D.S. Dobkin and D. Wheye. 1992. Birds in jeopardy. Stanford University Press; Stanford, California.

Hardesty, J.L. 1991. Conservation of coastal nesting bald eagles in Florida: history, demography, and habitat use. Unpublished Masters Thesis, University of Florida; Gainesville, Florida.

Harlow, R.F. 1959. An evaluation of white-tailed deer habitat in Florida. Florida Game and Fresh Water Fish Commission Technical Bulletin 5:1-64; Tallahassee, Florida.

Hartman, D.S. 1979. Ecology and behavior of the manatee (*Trichechus manatus*) in Florida. Special Publication: American Society of Mammologists Special Report No. 5: 1-153.

Hartman, D.S. 1974. Distribution, status and conservation of the manatee in the United States. National Technical Information Service. PB81-140725; Springfield, Virginia.

Hovis, J.A. and R.F. Labisky. 1996. Red-cockaded woodpecker. Pages 81-102 *in* J.A. Rodgers, Jr., H.W. Kale II, H.T. Smith, eds. Rare and endangered biota of Florida. Volume V: Birds, University Press of Florida; Gainesville, Florida.

Howell, A. H. 1932. Florida bird life. Florida Department of Game and Fresh Water Fish; Tallahassee, Florida.

Howell, A.H. 1919. Description of a new seaside sparrow from Florida. Auk 36:86-87.

Howell, A.H. 1921. A list of the birds of Royal Palm Hammock, Florida. Auk 38:250-263.

Howell, J.C. 1973. The 1971 status of 24 bald eagle nest sites in east central Florida. Auk 90:678-680.

Husar, S.L. 1977. The West Indian manatee (*Trichechus manatus*). United States Department of Interior, Fish and Wildlife Service, Wildlife Research Report 7; Washington, D.C.

Jackson, J.A. 1994. Red-cockaded woodpecker (*Picoides borealis*). *in* A. Poole and F. Gill, eds. The birds of North America, No. 85. The Academy of Natural Sciences; Washington, D.C., The American Ornithologists' Union; Philadelphia, Pennsylvania.

Jackson, J.A. 1978. Analysis of the distribution and popu lation status of the Red-cockaded Woodpecker. Pages 101-111 *in* R.R. Odom and L. Landers, eds. Proceedings of the rare and endangered wildlife symposium. Georgia Department of Natural Resources, Game and Fish Division, Technical Bulletin WL4; Atlanta, Georgia.

Johnsgard, P.A. 1990. Hawks, eagles, and falcons of North America. Smithsonian Institution Press; Washington, D.C.

Kuntz, G.C. 1977. Endangered species: Florida Indigo. Florida Naturalist, 15-19.

Kushlan, J. and F.J. Mazzotti. 1989. Historic and present distribution of the American crocodile in Florida. Journal of Herpetology 23(1):1-7.

Kushlan, J.A. and O.L. Bass, Jr. 1983. Habitat use and the distribution of the Cape Sable seaside sparrow. Pages 139-146 in T.L. Quay, J.B. Funderberg, Jr., D.S. Lee, E.F. Potter, and C.S. Robbins, eds. Occasional Papers of the North Carolina Biological Survey, 1983-1985; Raleigh, North Carolina.

Kushlan, J.A., J.C. Ogden and A.L. Higer. 1975. Relation of water level and fish availability to wood stork reproduction in the southern Everglades, Florida. U.S. Geological Survey Open File Report 75-434. U.S. Government Printing Office; Washington, D.C.

Kushlan, J.A., O.L. Bass, Jr., L.L. Loope, W.B. Robertson Jr., P.C. Rosendahl and D.L. Taylor. 1982. Cape Sable seaside sparrow management plan. South Florida Research Center Report M-660. U.S. Department of the Interior, Everglades National Park; Homestead, Florida.

Land, E.D. 1994. Response of the wild Florida panther population to removals for captive breeding. Final Report, Study Number 7571. Florida Game and Fresh Water Fish Commission; Tallahassee, Florida.

Landers, J.L. and D.W. Speake. 1980. Management needs of sandhill reptiles in southern Georgia. Proceedings of the Annual Conference of the Southeastern Association of Fish and Wildlife Agencies 34:515-529.

Lang, J.W. 1975. The Florida crocodile: Will it survive? Chicago (Field) Museum of Natural History Bulletin 46(8):4-9.

Lawler, H.E. 1977. The status of *Drymarchon couperi* (Holbrook), the eastern indigo snake, in the southeastern U.S.A. Herpetological Review 8(3):76-79.

Lefebvre, L.W., T.J. O'Shea, G.B. Rathbun, and R.C. Best. 1989. Distribution, status, and biogeography of the West Indian manatee. Pages 567-610 *in* C.A. Wood, ed. Biogeography of the West Indies. Sandhill Crane Press; Gainesville, Florida.

Lennartz, M.R. and V.G. Henry. 1985. Endangered species recovery plan. Red-cockaded Woodpecker *Picoides borealis*. U.S. Fish and Wildlife Service; Atlanta, Georgia.

Lennartz, M.R., P.H. Geissler, R.F. Harlow, R.C. Long, K.M. Chitwood, and J.A. Jackson. 1983. Status of the red-cockaded woodpecker on federal lands in the South. Pages 7-12 *in* D.A. Wood, ed. Red-cockaded woodpecker sym posium II proceedings. Florida Game and Fresh Water Fish Commission; Tallahassee, Florida.

Ligon, J.D. 1970. Behavior and breeding biology of the red-cockaded woodpecker. Auk 87: 255-278.

Lockwood, J.L., K.H. Fenn, J.L. Curnutt, D. Rosenthall, K.L. Balent and A.L. Mayer. 1997. Life history of the endangered Cape Sable seaside-sparrow. Wilson bulletin. 109:720-731.

Maehr, D.S. 1990. Florida panther movements, social organization, and habitat utilization. Final Performance Report, Study No. 7502. Florida Game and Fresh Water Fish Commission, Tallahassee, Florida.

Maehr, D.S. 1988. Florida panther movements, social organizations and habitat utilization. Annual Performance Report, Study No. 7502. Florida Game and Fresh Water Fish Commission; Tallahassee, Florida.

Maehr, D.S., E.D. Land and M.E. Roelke. 1991. Mortality patterns of panthers in southwest Florida. Proceedings of the Annual Conference of the Southeastern Association of Fish and Wildlife Agencies 45:201-207.

Maehr, D.S., E.D. Land, J.C. Roof and J.W. McCown. 1990. Day beds, natal dens, and activity of Florida panthers. Proceedings of the Annual Conference of Southeast Fish and Wildlife Agencies 44:000-000.

Magnusson, W.E., K.A. Vliet, A.C. Pooley, and R. Whitaker. 1989. Reproduction. Pages 118-135 in: C.A. Ross, ed. Crocodiles and Alligators, Facts On File, Inc.; New York, New York.

Marine Mammal Commission (MMC). 1988. Preliminary assessment of habitat protection needs for West Indian manatees on the east coast of Florida and Georgia. PB89-162 002. U.S. National Technical Information Service; Silver Spring, Maryland.

Marmontel, M. 1993. Age determination and population biology of the Florida manatee, *Trichechus manatus latirostris*. Unpublished Ph.D. Dissertation. University of Florida; Gainesville, Florida.

Marmontel, M., S.R. Humphrey and T.J. O'Shea. 1997. Population Viability Analysis of the Florida Manatee (*Trichechus manatus latirostris)*, 1976-1991. Conservation Biology 11:2, 467-481.

Marmontel, M., D.K. Odell, and J.E. Reynolds III. 1992. Reproductive biology of South American manatees. Pages 293-312 *in* W.C. Hamlett, ed. Reproductive biology of South American vertebrates. Springer-Verlag; New York, New York.

Mazzotti, F.J. 1994. Status and trends of nesting of the American Crocodile in Everglades NP, Florida. Final Report to NP Service, Everglades NP; Homestead, Florida.

Mazzotti, F.J. 1989. Structure and function. Pages 42-57 in C.A. Ross ed. Crocodiles and Alligators, Facts On File, Inc.; New York, New York.

Mazzotti, F.J. 1983. The ecology of *Crocodylus acutus* in Florida. Ph.D. dissertation, Pennsylvania State University.

Mazzotti, F.J. and L.A. Brandt. 1995. A Biological Assessment of the Effects of the C-111 Project on the American Crocodile in Northeastern Florida Bay, Everglades National Park. Unpublished report prepared for Everglades National Park, Homestead, Florida.

Mazzotti, F.J. 1996. A Monitoring Program for the Endangered American Crocodile in Florida Bay. Marine Endangered Species, 1996 Abstracts.

Mazzotti, F.J., J.A. Kushlan, and A. Dunbar-Cooper. 1988. Desiccation and cryptic nest flooding as probable causes of egg mortality in the American crocodile, *Crocodylus acutus*, in Everglades NP, Florida. Florida Scientist 51(2):65-72.

McEwan, L. C. 1977. Nest site selection and productivity of the southern bald eagle. Unpublished Masters Thesis, University of Florida, Gainesville, Florida.

McEwan, L.C. and D.H. Hirth. 1979. Southern bald eagle productivity and nest site selection. Journal of Wildlife Management 43:585-594.

Moler, P. 1998. Personal communication. Biologist. Florida Game and Freshwater Fish Commission. Talahassee, Florida.

Moler, P.E. 1992. Eastern indigo snake. Pages 181-186 *in* P.E. Moler, ed. Rare and Endangered Biota of Florida, Volume III, Amphibians and Reptiles. University Press of Florida; Gainesville, Florida.

Moler, P. 1991. American crocodile nest survey and monitoring. Final Report to Study No. 7533, Florida Game and Fresh Water Fish Commission, Bureau of Wildlife Research; Tallahassee, Florida.

Moler, P.E. 1985. Home range and seasonal activity of the eastern indigo snake, *Drymarchon corais couperi*, in northern Florida. Final Performance Report, Study E-1-06, III-A-5. Florida Game and Fresh Water Fish Commission; Tallahassee, Florida.

Montana Bald Eagle Working Group. 1991. Habitat management guide for bald eagles in northwestern Montana. Bureau of Land Management; Billings, Montana.

Moulis, R. 1976. Autecology of the eastern indigo snake *Drymarchon corais couperi*. Bulletin of the New York Herpetological Society 12(3-4):14-23.

Mount, R.H. 1975. The reptiles and amphibians of Alabama. Auburn University Experimental Station; Auburn, Alabama.

National Park Service. 1993. Hydrological Evaluation of the Proposed Alternatives for the U.S. Army Corps of Engineers' General Re-evaluation Report for the C-111 Basin. Technical Report SFNRC 93-4, prepared by the South Florida Research Center, Everglades National Park, Homestead, Florida.

Neill, W.T. 1971. The Last of the Ruling Reptiles. Columbia University Press; New York, New York.

Nesbitt, S.A. 1995. Bald eagle population monitoring. Annual Performance Report, Florida Game and Fresh Water Fish Commission; Gainesville, Florida.

Nicholson, D. J. 1926. Nesting habitats of the Everglade kite in Florida. Auk 43:62 67.

Nicholson, D.J. 1928. Nesting habits of seaside sparrows in Florida. Wilson Bulletin 40:234-237.

Norris, R. A. 1968. Seaside sparrow: western gulf coast subspecies. *In*, A.C. Bent (O. L. Austin, Jr. ed.), Life histories of North American Cardinals, Grosbeaks, Buntings, Towhees, Finches, Sparrows and Allies. U.S. National Museum Bull. 237:841-849.

Nott, M.P., O.L. Bass, Jr., D.M. Fleming, S.E. Killeffer, N. Fraley, L. Manne, J.L. Curnutt, J.M. Brooks, R. Powell and S.L. Pimm. 1998. Water levels, rapid vegetational changes, and the endangered Cape Sable seaside sparrow. Animal Conservation 1, 23-32.

Ogden, J.C. 1998. Personal communication. Ecologist. South Florida Water Management District. West Palm Beach, Florida.

Ogden, J.C. 1998. Endangered Species Performance Measure (Wood Stork). Unpublished document prepared for the SERA planning process. South Florida Water Management District, West Palm Beach, Florida.

Ogden, J.C. 1996. Wood Stork in J.A. Rodgers, H. Kale II, and H.T. Smith, eds. Rare and Endangered Biota of Florida. University Press of Florida; Gainesville, Florida.

Ogden, J.C. 1994. A Comparison of Wading Bird Nesting Colony Dynamics (1931-1946 and 1974-1989) as an Indication of Ecosystem Conditions in the Southern Everglades. *In* Everglades: the ecosystem and its restoration. pp. 419-444. Davis, S.M. and J.C. Ogden, *eds*. St. Lucie Press, Delray Beach, Florida.

Ogden, J.C. 1991. Nesting by wood storks in natural, altered, and artificial wetlands in central and northern Florida. Colonial Waterbirds, Volume 14: 39-45.

Ogden, J.C. 1978. American crocodile. Pages 21-22. in R. W. McDiarmid ed. Rare and endangered biota of Florida, Volume 3: amphibians and reptiles. University Presses of Florida; Gainesville, Florida. Ogden, J. C. 1978b. Status and nesting biology of the American crocodile, *Crocodylus acutus* (Reptilia, Crocodylidae) in Florida. Journal of Herpetology 12(2):183-196.

Ogden, J.C., J.A. Kushlan and J.T. Tilmant. 1978. The food habits and nesting success of wood storks in Everglades National Park in 1974. U.S. Department of the Interior, National Park Service, Natural Resources Report No. 16.

Ogden, J.C. and S.A. Nesbitt. 1979. Recent wood stork population trends in the United States. Wilson Bull 91(4):512-523.

Ogden, J.C., D.A. McCrimmon, Jr., G.T. Bancroft and B.W. Patty. 1987. Breeding populations of the wood stork in the southeastern United States. Condor. 89:752-759.

Packard, J.M. 1985. Preliminary assessment of uncertainty involved in modeling manatee populations. Manatee Population Research Report No. 9. Technical Report No. 8-9. Florida Cooperative Fish and Wildlife Research Unit. University of Florida; Gainesville, Florida.

Palmer, R.S. 1988. Handbook of North American birds, Volume 4. Yale University Press; New Haven, Connecticut.

Palmer, R.S. 1962. Handbook of North American birds, Volume 1, Loons through Flamingos. Yale University Press; New Haven, Connecticut.

Pemberton, R.W. 1988. Myrmechorchory in the introduced range weed, leafy spurge (*Euphorbia esula* L.). American Midland Naturalist 119(2):431-435.

Peterson, D.W. and W.B. Robertson, Jr. 1978. Threatened southern bald eagle. Pages 27-30 *in* H.W. Kale II, ed. Rare and endangered biota of Florida: Volume two, birds. University Presses Florida; Gainesville, Florida.

Pimm, S.L. 1998. Personal communication. Professor of Biology, University of Tennessee, Knoxville.

Pimm, S.L. 1998. An assessment of the risk of extinction for the Cape Sable Seaside-Sparrow. Unpublished report prepared for the U.S. Fish & Wildlife Service and Everglades National Park, Vero Beach and Homestead, Florida.

Pimm, S.L. 1997. An assessment of the risk of extinction for the Cape Sable Seaside-Sparrow. Chapter 10 of an unpublished annual report for 1997.

Pimm, S.L. 1996. Personal communication. Professor of Biology, University of Tennessee, Knoxville.

Pimm, S.L., K. Balent, T. Brooks, J. Curnutt, T. Fenn, N. Fraley, S. Killeffer, J. Lockwood, L. Manne, A. Mayer, M.P. Nott, G. Russell and E. Stanton. 1996. Population ecology of the Cape Sable seaside sparrow, draft report. Unpublished report prepared for the U.S. National Park Service and the U.S. Fish and Wildlife Service; Vero Beach, Florida.

Pimm, S.L., T. Brooks, J.L. Curnutt, J. Lockwood, L. Manne, A. Mayer, M.P. Nott and G. Russell. 1995. Population ecology of the Cape Sable seaside sparrow (*Ammodramus maritima mirabilis*), Annual Report 1995. Unpublished report prepared for the U.S. National Park Service and the U.S. Fish and Wildlife Service; Vero Beach, Florida.

Pimm, S.L., J.L. Curnutt and M.P. Nott. 1994. Population ecology of the Cape Sable seaside sparrow (*Ammodramus maritima mirabilis*), Annual Report 1994. Unpublished report prepared for the U.S. National Park Service and the U.S. Fish and Wildlife Service. U.S. Fish and Wildlife Service; Vero Beach, Florida.

Post, W. 1974. Functional analysis of space-related behavior in the seaside sparrow. Ecology 55:564-575.

Powell, J.A. and G.B. Rathbun. 1984. Distribution and abundance of manatees along the northern coast of the Gulf of Mexico. Northeast Gulf Science 7(1): 1-28.

Rathbun, G.B., J.P. Reid, R.K. Bonde, and J.A. Powell. 1992. Reproduction in free-ranging West Indian manatees (*Trichechus manatus*). Pages 19-20 *in* T.J. O'Shea, B.B. Ackerman, and H.F. Percival, eds. Interim report of the technical workshop on manatee population biology. Manatee Population Research Report Number 10. Florida Cooperative Fish and Wildlife Research Unit, University of Florida; Gainesville, Florida.

Reid, J.P., R.K. Bonde, and T.J. O'Shea. 1992. Reproduction, mortality, and tag loss of telemetered and recognizable individual manatees on the Atlantic Coast of Florida. Pages 20-21 *in* T.J. O'Shea, B.B. Ackerman, and H.F. Percival, eds. Interim report of the technical workshop on manatee population biology. Manatee Population Research Report No. 10. Florida Cooperative Fish and Wildlife Research Unit, University of Florida; Gainesville, Florida.

Rodgers, J.L., Jr. 1990. Breeding chronology and clutch information for the wood stork from museum collections. Journal of Field Ornithology 61(1):47-53.

Rodgers, J. A., Jr., S. T. Schwikert, and A. S. Wenner. 1988. Status of the snail kite in Florida: 1981-1985. American Birds 42: 30-35.

Schemnitz, S.D. 1972. Distribution and abundance of alligator, bear, deer, and panther in the Everglades Region of Florida. Report by the Florida Game and Fresh Water Fish Commission, Ft. Lauderdale, Florida in fulfillment of contract No. 14-16-0004-308.

Seal, U.S., R.C. Lacy, and Workshop Participants. 1989. Florida panther viability analysis and species survival plan. Report to the U.S. Fish and Wildlife Service, by the Conservation Breeding Specialist Group, Species Survival Commission, IUCN; Apple Valley, Minnesota.

Shapiro, A.E. 1983. Characteristics of red-cockaded woodpecker cavity trees and colony areas in southern Florida. Florida Scientist 46:84-95.

Sirenia. 1993. 1993 Annual report on the radio telemetry of manatees in Puerto Rico. Sirenia Project, National Biological Service; Gainesville, Florida.

Small, J.K. 1903. Flora of the southeastern United States. Published by the author; New York, New York.

Small, J.K. 1933. Manual of the Southeastern Flora. University of North Carolina Press; Chapel Hill, North Carolina.

Smith, K.N. 1993. Manatee habitat and human-related threats to seagrass in Florida: A review. Department of Environmental Protection, Division of Marine Resources; Tallahassee, Florida.

Smith, C.R. 1987. Ecology of juvenile and gravid eastern indigo snakes in north Florida. Unpublished M.S. Thesis, Auburn University; Auburn, Alabama.

Snow, R. 1998. Personal communication. Biologist. Everglades National Park. Homestead, Florida.

Speake, D.W., J.A. McGlincy and T.R. Colvin. 1978. Ecology and management of the eastern indigo snake in Georgia: A progress report. Pages 64-73 *in* R.R. Odum and L. Landers, eds. Proceedings of Rare and Endangered Wildlife Symposium, Georgia Department of Natural Resources, Game and Fish Division, Technical Bulletin WL 4.

Sprunt, A., Jr. 1968. MacGillivray's seaside sparrow. Pages 831-835 *in* A.C. Bent, O.L. Austin, Jr., eds. Life Histories of North American Cardinals, Grosbeaks, Buntings, Towhees, Finches, Sparrows, and Allies. U.S. National Museum Bulletin; Washington, D.C.

Sprunt, A., Jr. 1954. Florida bird life. Coward-McCann, Incorporated and National Audubon Society; New York.

Sprunt, A., Jr. 1945. The phantom of the marshes. Audubon Magazine 47: 15-22.

Stevenson, H.M. and B.H. Anderson. 1994. The birdlife of Florida. University Press of Florida; Gainesville, Florida.

Stieglitz, W. O., and R. L. Thompson. 1967. Status and life history of the Everglade kite in the United States. Bureau of Sport Fisheries and Wildlife, Scientific Report Wildlife, Number 109.

Stimson, L.A. 1956. The Cape Sable seaside sparrow: it's former and present distribution. Auk 73:489-502.

Stimson, L.A. 1968. Cape Sable sparrow. Pages 859-868 *in* A.C. Bent , O.L. Austin, Jr., eds. Life histories of North American Cardinals, Grosbeaks, Buntings, Towhees, Finches, Sparrows, and Allies. U.S. National Museum Bulletin; Washington, D.C.

Sykes, P. W., Jr. 1983. Recent population trends of the Everglade snail kite in Florida and its relationship to water levels. Journal of Field Ornithology 54:237-246.Sykes, P. W., Jr. 1983a. Recent population trends of the Everglade snail kite in Florida and its relationship to water levels. Journal of Field Ornithology 54:237-246.

Sykes, P. W., Jr. 1987. Some aspects of the breeding biology of the snail kite in Florida. Journal Field Ornithology 58:171-189.

Sykes, P. W., Jr. 1979. Status of the Everglade Kite in Florida—1968-1978. Wilson Bulletin 91:495-511.

Taylor, D.L. 1983. The seaside sparrow, its biology and management. Pages 147-152. *in* T.L. Quay *et al.*, eds., Occasional papers of the North Carolina Biological Sur-vey. North Carolina State Museum; Raleigh, North Carolina.

Trost, C.H. 1968. Dusky seaside sparrow. Pages 859-868 in A.C. Bent, O.L. Austin, Jr., eds. Life histories of North American Cardinals, Grosbeaks, Buntings, Towhees, Finches, Sparrows, and Allies. U.S. National Museum Bulletin; Washington, D.C.

U.S. Army Corps of Engineers. 1995. Environmental Assessment and Finding of No Significant Impact for Test Iteration 7 of the Experimental Program of Water Deliveries to Everglades National Park. Corps, Atlanta, Georgia.

U.S. Army Corps of Engineers. 1992. General Design Memorandum and Environmental Impact Statement: Modified Water Deliveries to Everglades National Park. Corps, Atlanta, Georgia.

U.S. Fish and Wildlife Service. 1998. Technical/Agency Draft Multi-Species Recovery Plan for the Threatened and Endangered Species of South Florida, Volume I. U.S. Fish and Wildlife Service, Atlanta, Georgia.

U.S. Fish and Wildlife Service. 1996a. Florida Manatee Recovery Plan. U.S. Fish and Wildlife Service, Atlanta, Georgia.

U.S. Fish and Wildlife Service. 1996b. Revised recovery plan for the U.S. breeding population of the wood stork. On file at U.S. Fish and Wildlife Service; Atlanta, Georgia.

U.S. Fish and Wildlife Service. 1986. Everglades snail kite *(Rostrhamus sociabilis plumbeus)* revised recovery plan. On file at U.S. Fish and Wildlife Service; Atlanta, Georgia.

U.S. Fish and Wildlife Service. 1985. Red-cockaded woodpecker recovery plan. On file at U.S. Fish and Wildlife Service; Atlanta, Georgia.

U.S. Fish and Wildlife Service. 1984. American crocodile recovery plan. U.S. Fish and Wildlife Service; Atlanta, Georgia.

U.S. Fish and Wildlife Service. 1983. Cape Sable seaside sparrow recovery plan. U.S. Fish and Wildlife Service; Atlanta, Georgia.

U.S. Geological Survey - Biological Resources Division and the Institute for Environmental Modeling. 1998. ATLSS: Across Trophic Levels System Simulation, Description of ATLSS Models. Published May 3, 1998, University of Tennessee and Florida Caribbean Science Center, Knoxville, Tennessee.

Van Lent, T. and S. Pimm. 1998. Proposed Termination Conditions for the Emergency Actions on Behalf of the Cape Sable Seaside Sparrow. South Florida Natural Resource Center, Everglades National Park and University of Tennessee, Knoxville.

Van Lent, T., R. Snow and F. James. 1999. An Examination of the Modified Water Deliveries Project, the C-111 Project, and the Experimental Water Deliveries Project: Hydrologic Analysis and Effects on Endangered Species. Technical Report prepared by the South Florida Natural Resources Center, Everglades National Park, Homestead, Florida.

Walters, J.R. 1990. Red-cockaded woodpeckers: a "primitive" cooperative breeder. Pages 69-101 *in* P.B. Stacey and W.D. Koenig, eds. Cooperative breeding in birds, Cambridge University Press; Cambridge, England.

Webster, R.L. 1967. Genera of Euphorbiaceae. Journal of the Arnold Arboretum. 48.

Werner, H.W. 1978. Distribution, habitat, and origin of the Cape Sable seaside sparrow. Unpublished M.A. thesis. University of South Florida; Tampa, Florida.

Werner, H.W. 1976. Distribution, habitat, and origin of the Cape Sable seaside sparrow. Unpublished M.A. thesis. University of South Florida; Tampa, Florida.

Werner, H.W. 1975. The biology of the Cape Sable sparrow. Unpublished report prepared for the U.S. Fish and Wildlife Service. U.S. Department of the Interior, Everglades National Park; Homestead, Florida.

Werner, H.W. and G.E. Woolfenden. 1983. The Cape Sable sparrow: its habitat, habits, and history. Pages 55-75 *in* T.L. Quay, J.B. Funderburg Jr., D.S. Lee, E.F. Potter, and C.S. Robbins, eds. The Seaside Sparrow, Its Biology and Management. North Carolina Biological Survey and North Carolina State Museum; Raleigh, North Carolina.

Wood, D.A. 1996. Promoting red-cockaded woodpecker welfare in Florida. Nongame Wildlife Management Bulletin Number 1. Florida Game and Fresh Water Fish Commission; Tallahassee, Florida.

Wood, P.B. 1987. Distribution, ownership status, and habitat characteristics of bald eagle nest sites in Florida. Final report Nongame Wildlife Project 85-020, Florida Game and Fresh Water Fish Commission; Tallahassee, Florida.

Wood, P.B., T.C. Edwards and M.W. Collopy. 1989. Characteristics of bald eagle nesting habitat in Florida. Journal of Wildlife Management 53(2):441-449.

Wood, P.B. and M.W. Collopy. 1995. Population ecology of subadult southern Bald Eagles in Florida: post-fledging ecology, migration patterns, habitat use, and survival. Final report to Florida Game and Fresh Water Fish Commission, Nongame Wildlife Program, Tallahassee, Florida.

Woolfenden, G.E. 1968. Northern seaside sparrow. Pages 153-162 *in* A.C. Bent, O.L. Austin, Jr., eds. Life histories of North American Cardinals, Grosbeaks, Buntings, Towhees, Finches, Sparrows, and Allies. U.S. National Museum Bulletin; Washington, D.C.

Woolfenden, G.E. 1956. Comparative breeding behavior of *Ammospiza candacuta* and *A. maritima.* University of Kansas Publishing, Museum of Natural History; Lawrence, Kansas.